(19) JAPANESE PATENT OFFICE (JP)

(12) Publication of Unexamined Patent Application (KOKAI) (A)

(11) Japanese Patent Application Kokai Number: **H1-237591**

(43) Kokai Publication Date: September 22, 1989

(51) Int. Cl.[4]	Identification Symbol	JPO File No.
G 09 F 9/00	348	Q-6422-5C
G 02 F 1/133	301	8806-2H
	324	7370-2H
G 09 F 9/00	350	A-6422-5C

Request for Examination: Not requested Number of Claims: 4 (8 pages total)

(54) Title of the Invention: LIQUID CRYSTAL DISPLAY DEVICE

(21) Application Number: S63-64580

(22) Filing Date: March 17, 1988

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SPECIFICATION

1. Title of the Invention

LIQUID CRYSTAL DISPLAY DEVICE

2. Claims

(1) A liquid crystal display device comprising a liquid crystal panel, a plurality of tape carriers on which driving ICs that drive this liquid crystal panel are mounted, and circuit wiring that inputs [power] into each of these tape carriers,

this liquid crystal display device being characterized in that

the terminals of the peripheral edge portions of the above-mentioned liquid crystal panel and the terminals of the tape carriers are connected via anisotropic conductive films, the tape carriers are bent in the direction of depth with respect to the connecting surfaces in the vicinity of the outsides of these connection parts,

[the device] further comprises a frame-form case made of metal in which a front surface part that covers the peripheral edge portions of the above-mentioned liquid crystal panel and depth parts that are oriented in the direction of depth from the outer periphery of this front surface part are formed by bending, the above-mentioned circuit wiring is integrally formed on the inside surfaces of these case depth parts, the connection parts of the liquid crystal panel and tape carriers that are connected by the anisotropic conductive films are covered and pressed from the front side by the front surface part of the above-mentioned case, the outsides of the portions of the tape carriers that are bent in the direction of depth are covered by the above-mentioned depth parts [of the case], and the input terminals of the above-mentioned tape carriers are connected to the terminals of the circuit wiring formed as an integral part of the above-mentioned case.

(2) A liquid crystal display device comprising a liquid crystal panel, a plurality of tape carriers on which driving ICs that drive this liquid crystal panel are mounted, and circuit wiring that inputs [power] into each of these tape carriers,

this liquid crystal display device being characterized in that

the terminals of the peripheral edge portions of the above-mentioned liquid crystal panel and the terminals of the tape carriers are connected via anisotropic conductive films, the tape carriers are bent in the direction of depth with respect to the connecting surfaces in the vicinity of the outsides of these connection parts,

[the device] further comprises a case made of metal which is disposed on the outsides of the above-mentioned liquid crystal panel and tape carriers, this case comprises an outer frame made of metal in which a front surface part that covers the peripheral edge portions of the above-

mentioned liquid crystal panel and joining parts that are oriented in the direction of depth from at least portions of the outer periphery of this front surface part are formed by bending, and a case body made of metal which is joined by bonding to the joining parts of the above-mentioned outer frame and which forms the depth parts of the case, the above-mentioned circuit wiring is integrally formed on the inside surfaces of this case body, the connection parts of the liquid crystal panel and tape carriers that are connected by anisotropic conductive films are covered and pressed from the front side by the front surface part of the above-mentioned case, the outsides of the portions of the tape carriers that are bent in the direction of depth are covered by the above-mentioned depth parts [of the case], and the input terminals of the above-mentioned tape carriers are connected to the terminals of the circuit wiring formed as an integral part of the above-mentioned case.

(3) The liquid crystal display device according to Claim 1 or 2, which is characterized in that the device comprises a tightening frame that is disposed on the inside of the case, this tightening frame [is a frame in which] a retaining part that faces the front surface part of the above-mentioned case and tightening parts that face the corner parts of the depth parts of the above-mentioned case from the outsides of the corner parts of the above-mentioned retaining part are formed by bending, the connection parts of the liquid crystal panel and tape carriers that are connected by anisotropic conductive films are clamped from the inside and outside by the front surface part of the above-mentioned case and the retaining part of the tightening frame, and the depth parts of the case and the tightening parts of the tightening frame are tightened and fastened.

(4) The liquid crystal display device according to Claim 1, 2 or 3, which is characterized in that the liquid crystal panel [is a panel in which] the corner parts of the glass substrates on which terminals used for connection with the tape carriers are lined up are cut away.

3. Detailed Description of the Invention

(Object of the Invention)

(Field of Industrial Utilization)

The present invention relates to a liquid crystal display device in which the mounting structure of the ICs, etc., used for driving is improved.

(Prior Art)

In various types of liquid crystal display devices such as liquid crystal televisions, the display part is formed with a large size; however, it is desirable that the electronic circuits other than the display part be as small as possible, and that these circuits be assembled in a compact manner.

Conventionally, wire bonding (hereafter [abbreviated to] "WB"), tape automatic bonding (hereafter [abbreviated to] "TAB"), flip-chip bonding (hereafter [abbreviated to] "FCB"), and the like have been used for the assembly of electronic circuits of this type. In all of these methods, naked ICs are used as the driving ICs, and it may be said that these are high-density IC mounting techniques that aim at miniaturization rather than ICs contained in flat packages.

Among these [techniques], TAB is superior to WB in terms of mass production characteristics, and is superior to FCB in terms of stress reliability; furthermore, this technique can easily accomplish the mixed mounting of resistor, capacitor, inductor (hereafter [referred to as] "R.C.L.") passive part chips used in spurious noise reduction filters. Accordingly, this technique is widely used as an IC mounting technique in liquid crystal televisions.

For example, in high-precision, high-image-quality liquid crystal televisions, approximately 100,000 thin-film transistors (hereafter [abbreviated to] "TFTs") are respectively arranged in a regular manner in the row and column directions in the display region of a set in which the diagonal size of the display parts of the glass substrates is 4 inches. These respective TFTs constitute unit pixels, and are connected to an independent transparent electrode for each of these unit pixel regions; these TFTs open a liquid crystal shutter by applying a certain specified potential to a counter electrode which is disposed with a liquid crystal interposed.

The above-mentioned respective TFTs are connected to numerous terminals (arranged on the peripheral edge portions of the glass substrates) by parallel lead wires in both the row and column directions. For example, in a device with a diagonal size of 4 inches, 220 terminals are disposed in the row direction, and 480 terminals are disposed in the column direction*. The corresponding TFTs are driven by applying a voltage to these [terminals] at a specified controlled timing, so that the liquid crystal shutters corresponding to these TFTs are opened and closed (including halftones). Accordingly, a full color display can be achieved by superimposing color filters on these liquid crystal shutters, and causing light to pass through.

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* Translator's note: The terms "row" and "column" appear to be consistently reversed in the Japanese source document; our translation faithfully reflects the wording in the original text.

As was described above, 220 terminals are disposed in the row direction and 480 terminals are disposed in the column direction on the peripheral edge portions of the glass substrates of the liquid crystal panel, and the connecting structure of these terminals and the driving ICs is a problem. For example, in regard to the column direction, the opposite side is also used; accordingly, assuming that 240 terminals are connected on one side of 80 mm, the pitch of the terminals is 333 μm. Furthermore, assuming that 220 terminals are connected on one side of 60 mm in the case of the row direction, the pitch of the terminals is 272 μm, so that a technique for connecting numerous [terminals] at a high density is required.

Conventionally, as is shown in Figure 5, [a technique has been used in which] the numerous terminals disposed on the peripheral edge portions of the liquid crystal panel 11 and the tape carriers 13 on which the naked driving ICs 12 are mounted are connected, and these tape carriers 13 are connected to a printed board 14 using a glass-epoxy laminated board as a base, on which circuit wiring for the above-mentioned ICs 12 is formed.

In order to connect the above-mentioned ICs 12 and tape carriers 13, gold (Au) bumps are formed on the terminals of the ICs 12, and the copper (Cu) leads of the tape carriers 13 are plated with tin (Sn). Then, after these connection positions have been aligned, heat and pressure are applied so that an Au/Sn eutectic [alloy] is formed, thus integrally joining the respective parts. The number of output terminals of the above-mentioned ICs 12 is 120, and the number of output terminals of the tape carriers 13 connected to these output terminals is 120, formed at (for example) a pitch of 333 μm in accordance with the pitch and number of the terminals of the liquid crystal panel 11. Then, after these terminals are caused to face each other, the terminals are connected by interposing anisotropic conductive films, and applying heat and pressure to these parts. Furthermore, as was described above, since the number of terminals on one side is 240 in the column direction, and the number of terminals of the tape carriers 13 is 120, two tape carriers 13 are used on each side.

The above-mentioned anisotropic conductive films are band-form thin films in which conductive particles are scattered throughout an organic material. The resin is softened and crushed by the application of heat and pressure, so that the conductive particles connect [the terminals] in a state in which [these particles] are sandwiched between the corresponding terminals of the liquid crystal panel 11 and of the tape carriers 13.

(Problems that the Invention is to Solve)

The connection parts connected by the above-mentioned anisotropic conductive films have a weak bonding strength, and if an external force oriented in the stripping direction is applied to

these parts, the connections between the terminals of the liquid crystal panel 11 and the terminals of the tape carriers 13 that were in an electrically connected state are separated, so that open terminals are generated. Thus, there are problems in terms of reliability.

Furthermore, in a liquid crystal television, it is desirable that the width dimension of the frame edge portions formed around the outer periphery of the display part be as small as possible even if the area of the display part formed by the liquid crystal panel 11 is large. However, in the above-mentioned construction, since the printed board 14 on which the circuit wiring is formed is disposed in a planar configuration on the outside of the liquid crystal panel 11, the width of the above-mentioned frame edge portions cannot be reduced. In order to form a filter circuit that is used to reduce spurious radiation noise that arises in the case of on-the-air reception, and a resistance circuit that is used to delay (smooth) the rise (or fall) of the pulse waveform, etc., various types of R.C.L. passive part chips are mounted on this printed board 14 in numbers of up to approximately 60 to 80 chips. Furthermore, [both] the circuit wiring formed here and wiring used for the connections with the input terminals of the tape carriers 13 that are interposed between [the printed board 14] and the input terminals of the ICs 12 are required, so that a [wiring] area of a certain considerable size is required.

The width of the above-mentioned frame edge portions depends directly on the area of the above-mentioned printed board 14; since this [printed board] is large, the width of the frame edge portions is also increased to a large size. Accordingly, a liquid crystal television which has a large external size for the display area is produced, which runs counter to the reduction in size that is the original object of a liquid crystal television.

The object of the present invention is to provide a liquid crystal display device in which no faulty connections are generated in the terminal parts of the liquid crystal panel, and in which the area of the frame edge portions surrounding the display part is small.

(Constitution of the Invention)

(Means for Solving the Problems)

The invention of Claim 1 is a liquid crystal display device comprising a liquid crystal panel, a plurality of tape carriers on which driving ICs that drive this liquid crystal panel are mounted, and circuit wiring that inputs [power] into each of these tape carriers, this liquid crystal display device being characterized in that the terminals of the peripheral edge portions of the above-mentioned liquid crystal panel and the terminals of the tape carriers are connected via anisotropic conductive films, the tape carriers are bent in the direction of depth with respect to the connecting surfaces in the vicinity of the outsides of these connection parts, [the device] further

comprises a frame-form case made of metal in which a front surface part that covers the peripheral edge portions of the above-mentioned liquid crystal panel and depth parts that are oriented in the direction of depth from the outer periphery of this front surface part are formed by bending, the above-mentioned circuit wiring is integrally formed on the inside surfaces of these case depth parts, the connection parts of the liquid crystal panel and tape carriers that are connected by the anisotropic conductive films are covered and pressed from the front side by the front surface part of the above-mentioned case, the outsides of the portions of the tape carriers that are bent in the direction of depth are covered by the above-mentioned depth parts [of the case], and the input terminals of the above-mentioned tape carriers are connected to the terminals of the circuit wiring formed as an integral part of the above-mentioned case.

The invention of Claim 2 is [characterized in that] instead of the case of Claim 1, the case comprises an outer frame made of metal in which a front surface part that covers the peripheral edge portions of the liquid crystal panel and joining parts that are oriented in the direction of depth from at least portions of the outer periphery of this front surface part are formed by bending, and a case body made of metal which is joined by bonding to the joining parts of the above-mentioned outer frame and which forms the depth parts of the case, and the circuit wiring is integrally formed on the inside surfaces of this case body,

The invention of Claim 3 is [characterized in that] in addition to the construction of Claim 1 or 2, [the device] comprises a tightening frame that is disposed on the inside of the case, this tightening frame [is a frame in which] a retaining part that faces the front surface part of the above-mentioned case and tightening parts that face the corner parts of the depth parts of the above-mentioned case from the outsides of the corner parts of the above-mentioned retaining part are formed by bending, the connection parts of the liquid crystal panel and tape carriers that are connected by anisotropic conductive films are clamped from the inside and outside by the front surface part of the above-mentioned case and the retaining part of the tightening frame, and the depth parts of the case and the tightening parts of the tightening frame are tightened and fastened.

The invention of Claim 4 is [characterized in that] in the construction of Claim 1, 2 or 3, the liquid crystal panel [is a panel in which] the corner parts of the glass substrates on which terminals used for connection with the tape carriers are lined up are cut away.

(Operation)

In the invention of Claim 1, the tape carriers connected to the liquid crystal panel are bent in the direction of depth with respect to the connection surfaces in the vicinity of the outsides of the

connection parts, and these connection parts and bent portions are covered from the outside by the case. Furthermore, the connection parts are pressed from the front side by the front surface part of the case. Accordingly, no external force oriented in the stripping direction is applied to the connection parts, so that no faulty connections are generated in the terminal portions of the liquid crystal panel, and a good connected state is maintained. Furthermore, since the tape carriers and case are both bent in the direction of depth with respect to the surface of the liquid crystal panel, and since the circuit wiring is integrally formed on the case, the width of the frame edge portions surrounding the liquid crystal panel can be conspicuously reduced, so that the external size can be reduced relative to the display area of the liquid crystal panel.

In the invention of Claim 2, since an outer frame and a case body on which the circuit wiring is formed are separately manufactured and then joined by bonding in the formation of the case, manufacture is facilitated.

In the invention of Claim 3, since the regions where the liquid crystal panel and tape carriers are connected by anisotropic conductive films are clamped from the inside and outside by the front surface part of the case and the retaining part of a tightening frame, and since the depth parts of the case and the tightening parts of the tightening frame are tightened and fastened at the corner parts of the display panel, sufficient tightening can easily be accomplished.

In the invention of Claim 4, there are no corner parts on the glass substrates forming [the portions of] the external shape of the liquid crystal panel that have the maximum size; accordingly, tightening such as that described above can easily be accomplished without increasing the size of the external shape.

(Embodiments)

One embodiment of the present invention will be described below with reference to the figures.

In Figures 1 and 2, the liquid crystal panel 11 is [an assembly] in which numerous TFTs and transparent electrodes, etc., that form unit pixels are disposed on two glass substrates 11A and 11B, and a liquid crystal is sealed between these two glass substrates 11A and 11B, as in conventional [liquid crystal panels]. Furthermore, the back surface-side glass substrate 11A is formed with a larger size than the front surface-side glass substrate 11B, so that the edge parts of this back surface-side glass substrate 11A protrude to the outside, and oblique parts 11a are formed by cutting away the four corner parts of these protruding edge parts. Moreover, the liquid crystal panel 11 need not be a so-called TFT-LCD using the above-mentioned TFTs; this liquid crystal panel 11 may be some other active matrix display device or dot matrix display

device. In any case, the liquid crystal panel 11 has glass substrates 11A and 11B, and numerous lead terminals used to drive the pixels are disposed on the peripheral edge portions (on three sides in the case shown in the figures) of the back surface-side glass substrate 11A. The numbers of these terminals, i.e., the number m in the vertical direction and the number n in the horizontal direction, are generally indicated by $Z = m \times n$, where Z is the total number of pixels. For example, if $Z = 105{,}600$ pixels are lined up on a display surface with a diagonal size of 4 inches in the liquid crystal panel 11, then 220 terminals in the vertical direction and 480 terminals in the horizontal direction are required. Furthermore, in regard to the driving ICs that drive the respective pixels via these respective terminals, for example, ICs in which 110 elements are contained in one chip are used in the vertical direction, and ICs in which 120 elements are contained in one chip are used in the horizontal direction. Specifically, driving in the vertical direction is performed using two ICs with 110 elements, and driving in the horizontal direction is performed using four ICs with 120 elements.

Here, the vertical sides and horizontal sides of the display part with a diagonal size of 4 inches are 40 mm × 80 mm. If the pitch of the terminals disposed on the peripheral edge portions of the liquid crystal panel 11 is less than 200 μm, a high degree of connection technology is required, so that connection becomes difficult. Accordingly, the terminal pitch is set at 333 μm by dividing the direction of the horizontal sides into upper and lower sides, and installing two ICs on each of these sides. Furthermore, in the vertical direction, the terminal pitch is 272 μm even on a single side, so that two ICs are installed on a single side alone.

Both of such vertical direction ICs 12Y and horizontal direction ICs 12X are respectively mounted on and electrically connected to a plurality of corresponding tape carriers 13Y and 13X. In this connection (as in a conventional device), following the positional alignment of the terminals of the ICs 12X and 12Y on which gold (Au) bumps are formed and the terminals of the tape carriers 13X and 13Y constituting a polyimide film base in which copper (Cu) leads are plated with tin (Sn), the terminals are joined by applying heat and pressure so that Au/Sn eutectic [crystallization] is caused to take place. Below, this will be referred to as ILB (inner lead bonding).

Next, the carrier tapes 13X and 13Y on which the ICs 12X and 12Y have been mounted as described above are connected to the terminals on the peripheral edge portions of the liquid crystal panel 11. This will be referred to below as OLB (outer lead bonding). This connection is accomplished using anisotropic conductive films. Specifically, the terminals of the liquid crystal panel 11 and the output terminals of the tape carriers 13X and 13Y are formed at the same pitch;

then, after the positions of these terminals are aligned, anisotropic conductive films are interposed, and the terminals are connected by the application of heat and pressure.

16 indicates a case made of metal; for example, this case is formed by a metal plate consisting of thin stainless steel, etc., with a thickness of approximately 0.5 to 1.0 mm. This case 16 has a frame shape comprising a planar front surface part 16a that covers the front surface peripheral edge portions of the above-mentioned liquid crystal panel 11, and depth parts 16b which are bent at right angles (as shown in the figures) or even more acute angles in the direction of depth from the outer periphery of the above-mentioned front surface part 16a. Furthermore, oblique joining surfaces 16c which correspond to the respective oblique parts 11a of the above-mentioned liquid crystal panel 11 are formed on the four corner parts of the depth parts 16b, and fastening holes 17 are formed in these joining surfaces 16c. Moreover, circuit wiring 18 is integrally formed on the inside surfaces of the depth parts 16b. This circuit wiring 18 respectively connects the terminals of the above-mentioned driving ICs 12X and 12Y, and provides specified voltages or signals to the input terminals of the driving ICs 12X and 12Y. Such a shape can easily be obtained by deep drawing.

19 indicates a tightening frame made of metal, which is disposed on the inside of the above-mentioned case 16. In this tightening frame 19, a retaining part 19a which faces the front surface part 16a of the above-mentioned case 16, and tightening parts 19b which face the joining surfaces 16c at the corner parts of the depth parts 16b of the above-mentioned case 16 from the outsides of the four corner parts of the above-mentioned retaining part 19a, are formed by bending. Furthermore, fastening holes 20 are formed in these tightening parts 19b.

After the above-mentioned respective tape carriers 13X and 13Y have thus been connected to the terminals of the liquid crystal panel 11, [the tape carriers] are bent in the direction of depth with respect to the connecting surfaces in the vicinity of the outsides of the connection parts as shown in the figures. In this case, if the polyimide base film corresponding to the bent parts is partially removed, no stress is generated in the OLB parts during bending.

In this state, the above-mentioned case 16 is caused to cover [the liquid crystal panel 11] from the side of the front surface of the liquid crystal panel 11, the OLB parts of the terminals of the liquid crystal panel 11 and the tape carriers 13X and 13Y connected by the anisotropic conductive films are covered from the front side by the front surface part 16a, and these parts are pressed by interposing a cushioning material 21 such as rubber, thus providing protection so that the bonded portions are not stripped. Furthermore, the portions of the tape carriers 13X and 13Y that are bent in the direction of depth, and the ICs 12X and 12Y that are mounted on these

portions of the tape carriers, are covered and protected from the outside by the depth parts 16b of the case 16.

Furthermore, the tightening frame 19 is disposed on the inside of the above-mentioned case 16, so that the connection parts of the liquid crystal panel 11 and tape carriers 13X and 13Y that are connected by the anisotropic conductive films are clamped (with a cushioning material 22 such as rubber interposed) from the inside and outside by the front surface part 16a of the case 16 and retaining part 19a of the tightening frame 19. Moreover, the joining surfaces 16c of the corner parts in the depth parts 16b of the case 16 and the tightening parts 19b of the tightening frame 19 are fastened together by means of screws, etc., via the fastening holes 17 and 20 with spacers interposed between the two parts.

Thus, if a tightening frame 19 is used, the OLB parts can be tightened and fastened much more firmly.

Thus, since the OLB parts, which have a relatively weak bonding strength, are covered and protected by the front surface part 16a of the case 16, there is no application of a force oriented in the stripping direction to these parts, so that a stable connected state can be maintained, thus improving the reliability. Furthermore, since the tape carriers 13X and 13Y that are connected to the terminals of the liquid crystal panel 11 and the case 16 that covers these parts are both bent in the direction of depth with respect to the surface of the liquid crystal panel 11, there is no positioning of ICs, printed boards or the like around the display part of the liquid crystal panel 11. Accordingly, the width of the so-called frame edge portions around the display part is not increased as in conventional [devices], and the dimensions of these frame edge portions can be reduced relative to the area of the display part, so that the overall device can be made more compact.

Furthermore, the input terminals of the tape carriers 13X and 13Y are connected by soldering to the terminals of the circuit wiring 18 that is integrally formed on the inside surfaces of the depth parts 16b of the above-mentioned case 16. Specifically, the input-side terminals of the above-mentioned ICs 12X and 12Y are connected to the circuit wiring 18 via the tape carriers 13X and 13Y. Moreover, in order to endow the case 16 with the function of an electromagnetic shield in electrical terms, several locations where noise is [to be] reduced are connected to the ground parts of the circuit wiring 18. As a result, there is no need for the separate installation of printed boards used to form circuit wiring as in conventional [devices], so that [the device] can be made more compact.

Next, the method used to accomplished the direct integral formation of the circuit wiring 18 on the inside walls of the depth parts 16b of the above-mentioned case 16 will be described.

First, in the metal material consisting of (for example) a stainless steel plate with a thickness of 0.5 mm that is used to form the case 16, a copper foil with a thickness of 25 μm is integrally pasted to the inside walls of the portions corresponding to the depth parts 16b by means of an epoxy resin. Next, the desired circuit wiring is formed by ordinary processes such as coating with a photoresist, exposure, developing and etching. Furthermore, an insulating paste is formed in two laminated layers, and a perfect insulating film that is free of pinholes is formed by a printing process. In this case, a state is produced in which the underlying copper foil is exposed only in the through-hole portions. Then, a copper paste is applied from above by printing and is hardened, so that circuit wiring consisting of two wiring layers is obtained. Furthermore, a solder resist is applied by printing on top of this; this coating is performed so that the above-mentioned underlying copper foil is exposed in places where connections will be made with the input terminals of the tape carriers 13X and 13Y and places where the passive part chips will be soldered afterward. Then, the plate material on which this circuit wiring has been integrated is subjected to bending and deep drawing, so that the case 16 is formed. Next, passive part chips, e.g., R.C.L. chip parts that form LC filters or RC filters that are used to reduce spurious radiation noise, are mounted by soldering on the portions where the above-mentioned underlying copper foil is exposed, thus forming circuit wiring 18 that is integrated with the case 16.

As was described above, after the case 16 is mounted on the liquid crystal panel 11, the input terminals of the tape carriers 13X and 13Y are connected by soldering to the above-mentioned circuit wiring 18. If necessary, furthermore, the case 16 and the ground parts of the circuit wiring 18 are connected, thus completing the assembly.

Furthermore, in cases where the circuit wiring 18 is integrally formed on the case 16, integration can also be accomplished by pasting thin flexible circuit boards on which multi-layer wiring is formed to the inside surfaces of the depth parts 16b of the case 16.

In the above-mentioned embodiment, a case formed as a single integral body was indicated as the case 16; however, as is shown in Figures 3 and 4, it would also be possible to use a case 16 in which an outer frame 16A which is made of stainless steel, etc., and which consists mainly of a front surface part 16a, and a square case body 16B made of aluminum, etc., which is used as the depth parts 16b, are combined [into a single unit]. In the above-mentioned outer frame 16A, joining parts 16c1 are integrally formed by being respectively bent in the direction of depth from the outer peripheries of the four corner parts of the front surface part 16a, and fastening holes 17a are formed in these joining parts 16c1. Furthermore, in the above-mentioned case body 16B,

joining parts 16c2 are formed on the four corner parts of the depth parts 16b, and fastening holes 17b are formed in these joining parts 16c2. Then, the joining parts 16c1 of the outer frame 16A are joined to the outside surfaces of the joining parts 16c2 of the case body 16B, and these parts are joined into an integral unit by means of an adhesive agent, so that these parts are assembled as the case 16. In this case, the circuit wiring 18 may be integrally formed on the inside surfaces of the case body 16B. Then, [this assembly] may be tightened together with the tightening frame 19 by means of the fastening holes 17a and 17b.

In all of the above-mentioned embodiments, the respective tape carriers 13X and 13Y, driving ICs 12X and 12Y and the circuit wiring 18 are surrounded by the metal case 16; accordingly, these parts are electromagnetically shielded, and are also protected from external forces, etc., by this case 16.

(Effect of the Invention)

In the invention of Claim 1, the tape carriers that are connected to the liquid crystal panel are bent in the direction of depth with respect to the connecting surfaces in the vicinity of the outsides of the connection parts, and these connection parts and bent portions are covered from the outside by the case. Furthermore, the connection parts are pressed from the front side by the front surface part of the case. Accordingly, no external force oriented in the stripping direction is applied to the connection parts, so that faulty connections are not generated in the terminal portions of the liquid crystal panel, and a good connected state is maintained so that reliability is improved. Furthermore, since the tape carriers and case are both bent in the direction of depth with respect to the front surface of the liquid crystal panel, and since the circuit wiring is formed as an integral part of the case, the number of parts can be reduced, and these parts can be made thinner, thus making it possible to achieve a conspicuous reduction in the width of the frame edge portions surrounding the liquid crystal panel, so that the size of the external shape can be reduced relative to the display area of the liquid crystal panel, and [the device] can be made more compact. In addition, the role of an electromagnetic shield can also be played by the metal case.

In the invention of Claim 2, since an outer frame and a case body on which the circuit wiring is formed are individually manufactured and joined by bonding in the formation of the case, the manufacture of the case is facilitated.

In the invention of Claim 3, since the regions of the liquid crystal panel and tape carriers that are connected by anisotropic conductive films are clamped from the inside and outside by the front surface part of the case and the retaining part of the tightening frame, and since the depth parts of the case and the tightening parts of the tightening frame are tightened and fastened at the

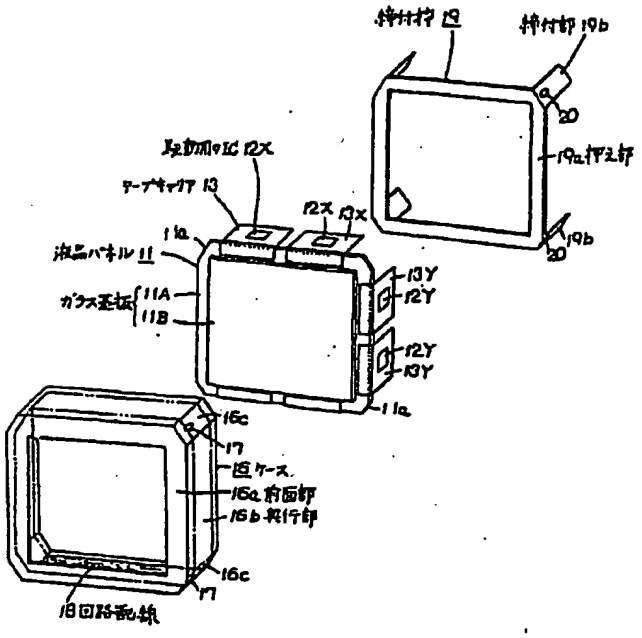
corner parts of the display panel, sufficient tightening can easily be accomplished, so that a stable connected state can be obtained.

In the invention of Claim 4, there are no corner parts on the glass substrates that form the maximum external size of the liquid crystal panel; accordingly, the above-mentioned tightening can easily be performed without increasing the external size, so that [the device] can easily be formed with a small size.

4. Brief Description of the Drawings

Figure 1 is an exploded perspective view which shows one embodiment of the liquid crystal display device of the present invention. Figure 2 is a sectional view which shows the assembled state [of the device shown] in Figure 1. Figure 3 is a partial sectional view which shows another embodiment of the liquid crystal display device of the present invention. Figure 4 is an exploded perspective view of the case shown in Figure 3. Figure 5 is a sectional view which shows a conventional device.

11... Liquid crystal panel; 11A, 11B... Glass substrates; 12X, 12Y... Driving ICs; 13X, 13Y... Tape carriers; 16... Case; 16a... Front surface part; 16b... Depth parts; 18... Circuit wiring; 19... Tightening frame; 19a... Retaining part; 19b... Tightening parts; 16A... Outer frame; 16B... Case body; 16c1, 16c2... Joining parts.



11:	Liquid crystal panel
11A, 11B:	Glass substrates
12X:	Driving ICs
13:	Tape carriers
16:	Case
16a:	Front surface part
16b:	Depth parts
18:	Circuit wiring
19:	Tightening frame
19a:	Retaining part
19b:	Tightening parts

Figure 1

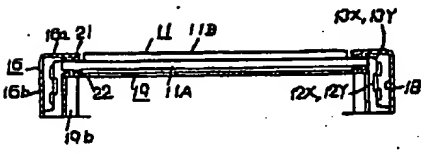


Figure 2

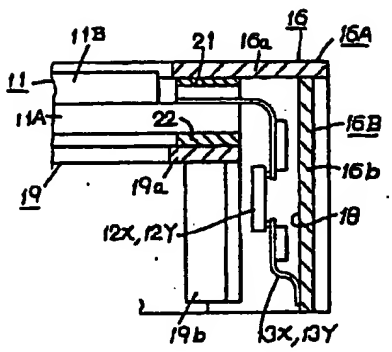
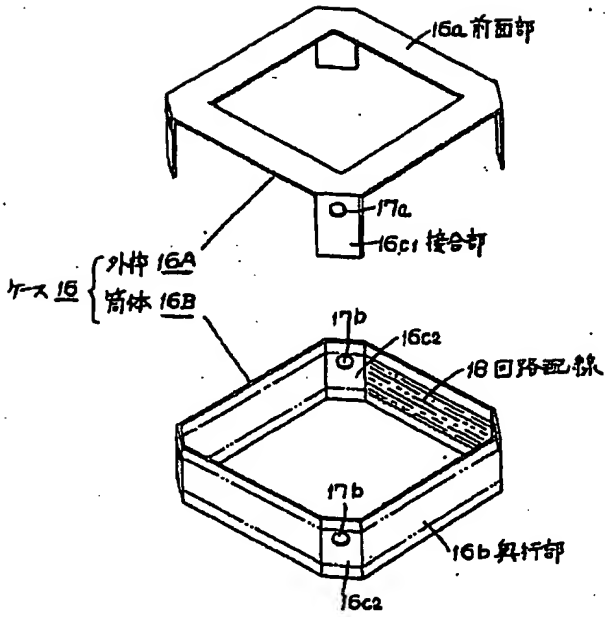


Figure 3



16:	Case
16A:	Outer frame
16B:	Case body
16a:	Front surface part
16b:	Depth parts
16c1:	Joining parts
18:	Circuit wiring

Figure 4

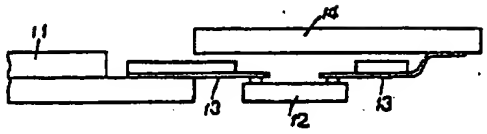


Figure 5

⑲日本国特許庁(JP)　⑪特許出願公開

⑫公開特許公報(A)　平1-237591

⑤Int.Cl.⁴		識別記号	庁内整理番号	⑬公開　平成1年(1989)9月22日
G 09 F	9/00	348	Q-6422-5C	
G 02 F	1/133	301	8806-2H	
		324	7370-2H	
G 09 F	9/00	350	A-6422-5C	審査請求　未請求　請求項の数 4　(全8頁)

⑭発明の名称　液晶表示装置

⑳特　願　昭63-64580
㉒出　願　昭63(1988)3月17日

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明　細　書

1．発明の名称

液晶表示装置

2．特許請求の範囲

（1）液晶パネルと、この液晶パネルを駆動する駆動用のICを搭載した複数のテープキャリアと、この各テープキャリアに入力する回路配線とを備えた液晶表示装置において、

前記液晶パネルの周縁部の端子とテープキャリアの端子とを異方性導電膜をもって接続するとともに、この接続部の外側近傍でテープキャリアをその接続面に対する奥行方向に折曲し、

また、前記液晶パネルの周縁部を覆う前面部およびこの前面部の外周からその奥行方向に向って奥行部を折曲形成した筒状の金属製のケースを備え、このケースの奥行部の内面に前記回路配線を一体化して形成し、前記ケースの前面部で液晶パネルとテープキャリアとの異方性導電膜による接続部を表側から覆って押圧するとともに、前記奥行部でテープキャリアの奥行方向に折曲された部分の外側を覆い、かつ、前記テープキャリアの入力端子を前記ケースに一体化して形成した回路配線の端子に接続した

ことを特徴とする液晶表示装置。

（2）液晶パネルと、この液晶パネルを駆動する駆動用のICを搭載した複数のテープキャリアと、この各テープキャリアに入力する回路配線とを備えた液晶表示装置において、

前記液晶パネルの周縁部の端子とテープキャリアの端子とを異方性導電膜をもって接続するとともに、この接続部の外側近傍でテープキャリアをその接続面に対する奥行方向に折曲し、

また、前記液晶パネルおよびテープキャリアの外側に配置する金属製のケースを備え、このケースは、前記液晶パネルの周縁部を覆う前面部およびこの前面部の外周の少なくとも一部からその奥行方向に向って接合部を折曲形成した金属製の外枠と、この外枠の接合部と接着結合しケースの奥行部をつくる金属製の筒体とからなり、この筒体の内面に前記回路配線を一体化して形成し、前

記ケースの前面部で液晶パネルとテープキャリアとの異方性導電膜による接続部を表側から覆って押圧するとともに、前記実行部でテープキャリアの実行方向に折曲された部分の外側を覆い、かつ、前記テープキャリアの入力端子を前記ケースに一体化して形成した回路配線の端子に接続した

ことを特徴とする液晶表示装置。

（３） ケースの内側に配設される補付枠を備え、この補付枠は、前記ケースの前面部に対向する押え部およびこの押え部の外部外側から前記ケースの実行部の外部に対向する補付部を折曲形成し、前記ケースの前面部と補付枠の押え部とで液晶パネルとテープキャリアとの異方性導電膜による接続部を内外側から挟圧するとともに、ケースの実行部と補付枠の補付部を補付け固定したことを特徴とする請求項１または２記載の液晶表示装置。

（４） 液晶パネルは、テープキャリアとの接続用の端子を設置したガラス基板の角部を切欠したことを特徴とする請求項１、２または３記載の液晶表示装置。

３．発明の詳細な説明

（発明の目的）

（産業上の利用分野）

本発明は、駆動用のＩＣ等の実装構造を改良した液晶表示装置に関する。

（従来の技術）

液晶テレビ等の各種の液晶表示装置においては、表示部は大きく形成するが、表示部以外の電子回路はできるだけ小形でコンパクトに組立てるものが望まれている。

ところで、従来、この種の電子回路の組立には、ワイアボンディング（以下、ＷＢ）、テープオートマティクボンディング（以下、ＴＡＢ）、フリップチップボンディング（以下、ＦＣＢ）等が用いられている。これらはいずれも駆動用のＩＣとして裸のＩＣを用いており、フラットパッケージに入れたものよりは、小形化を図ったＩＣ高密度実装技術といえるものである。

このうち、ＴＡＢは、ＷＢに比べて量産性に優れ、また、ＦＣＢに比べて応力信頼性に優れ、かつ、スプリアスノイズ減少フィルタ用としての抵抗、コンデンサ、インダクタ（以下、Ｒ.Ｃ.Ｌ.）受動部品チップを容易に組載できる。このため、液晶テレビのＩＣ実装技術として広く採用されている。

例えば、高精細高品位画質の液晶テレビでは、ガラス基板の表示部対角が４インチのもので、表示領域に約１０万個の薄膜トランジスタ（以下、ＴＦＴ）を、行および列方向のそれぞれに周期性を持たせて配列している。これら各ＴＦＴは単位画素を構成するもので、この単位画素領域部に独立した透明電極に接続されており、液晶を介して設けられた対向電極に対してある特定の電位を与えることにより、液晶シャッタを開く。

上記の各ＴＦＴは行および列方向ともパラレルリード線により、ガラス基板の周縁部に配列された多数の端子に接続される。例えば、対角４インチのもので、行方向には２２０本、列方向には４８０本の端子が設けられており、これらにコントロールされた所定のタイミングで電圧を印加することにより対応するＴＦＴが駆動され、このＴＦＴに対応する液晶シャッタが開閉（中間調を含む）動作する。したがって、これら液晶シャッタにカラーフィルタを重ね、ライトを通過させればフルカラーの表示が可能となる。

前述のように、液晶パネルのガラス基板の周縁部には行方向２２０本、列方向４８０本の端子が設けられており、これらの端子と駆動用のＩＣとの接続構成が問題となる。例えば、列方向についてみると、対向する辺も使用するので、一辺８０㎜に２４０本接続するとして、端子のピッチは３３３㎛となる。また、行方向は一辺６０㎜に２２０本接続するとして、端子のピッチは２７２㎛となり、高密度多数本の接続技術が必要となる。

従来は、第５図に示すように、液晶パネル11の周縁部に設けられた多数の端子と、裸の駆動用のＩＣ12を搭載したテープキャリア13を接続し、このテープキャリア13を、上記ＩＣ12への回路配線が形成されているガラスエポキシ回路板をベー

スとするプリント基板14に接続している。

上記のＩＣ12とテープキャリア13との接続に当っては、ＩＣ12の端子に金（Au）バンプを形成し、テープキャリア13の銅（Cu）リードにはすず（Sn）メッキを施しておく。そして、これら接続位置の整合を行なった後、加熱加圧してAu／Sn共晶を行なわせ、一体に結合する。上記ＩＣ12の出力端子は１２０本であり、これと接続したテープキャリア13の出力端子は、液晶パネル11の端子群のピッチおよび本数に合わせて、例えばピッチ３３３μmで１２０本作っておく。そして、これらを互いに対向させた後、異方性導電膜を介在させ、この間を加熱加圧することにより接続する。なお、前述したように、列方向は一辺の端子数は２４０本であり、テープキャリア13の端子数は１２０本なので、一辺当り２枚のテープキャリア13を用いる。

前記異方性導電膜とは、有機材料に導電粒子を点在させた形状の薄いフィルムのことで、加熱加圧により樹脂が軟化し、押しつぶされ、導電粒子が対応する液晶パネル11とテープキャリア13の端子間にはさまった状態で接続するものである。

（発明が解決しようとする課題）

上記異方性導電膜による接続部は接着強度が弱く、この部分に引きはがす方向の外力が加わると、電気的接続状態にあった液晶パネル11の端子とテープキャリア13の端子との接続が破れ、オープンとなる端子が生じ、信頼性に問題がある。

また、液晶テレビでは液晶パネル11による表示部面積が大きくなっても、その外周に形成される額縁部分の幅寸法は出来るだけ小さいことが望ましい。しかし、上記構成では、回路配線が形成されているプリント基板14が液晶パネル11の外側に平面状に設けられているため、前記額縁部分の幅を小さくすることができない。このプリント基板14には、オンエアで受信する際のスプリアスラジエーションノイズを低減させるためのフィルタ回路やパルス波形の立上り（下り）を遅くする（なまらせる）ための抵抗回路等を形成するために、各種のＩ.Ｃ.Ｌ.受動部品チップが約６０～８０個も搭載されている。さらに、ここに形成される回路配線と、ＩＣ12の入力端子との間に介在するテープキャリア13の入力端子との接続用配線が必要であり、ある程度の大きな面積が必要となる。

前記額縁部の幅は、上記プリント基板14の面積に直接依存しており、これが大きいため額縁部の幅も大きくなってしまう。このため表示面積の割に外形形状の大きな液晶テレビとなってしまい、液晶テレビ本来の目的である小形化に反してしまう。

本発明の目的は、液晶パネルの端子部分における接続不良が発生せず、また、表示部周囲の額縁部分の面積が小さい液晶表示装置を提供することにある。

（発明の構成）

（課題を解決するための手段）

請求項１の発明は、液晶パネルと、この液晶パネルを駆動する駆動用のＩＣを搭載した複数のテープキャリアと、この各テープキャリアに入力する回路配線とを備えた液晶表示装置において、前記液晶パネルの周縁部の端子とテープキャリアの端子とを異方性導電膜をもって接続するとともに、この接続部の外側近傍でテープキャリアをその接続面に対する実行方向に折曲し、また、前記液晶パネルの周縁部を覆う前面部およびこの前面部の外周からその実行方向に向って実行部を折曲形成した額縁状の金属製のケースを備え、このケースの実行部の内面に前記回路配線を一体化して形成し、前記ケースの前面部で液晶パネルとテープキャリアとの異方性導電膜による接続部を内側から覆って押圧するとともに、前記実行部でテープキャリアの実行方向に折曲された部分の外側を覆い、かつ、前記テープキャリアの入力端子を前記ケースに一体化して形成した回路配線の端子に接続したものである。

請求項２の発明は、請求項１のケースに代え、ケースは、液晶パネルの周縁部を覆う前面部およびこの前面部の外周の少なくとも一部からその実行方向に向って接合部を折曲形成した金属製の外枠と、この外枠の接合部と接着結合しケースの実

行部をつくる金属製の筒体とからなり、この筒体の内面に回路配線を一体化して形成したものである。

請求項3の発明は、請求項1または2の構成に加え、ケースの内側に配設される締付枠を備え、この締付枠は、前記ケースの前面部に対向する押え部およびこの押え部の角部外側から前記ケースの実行部の角部に対向する締付部を折曲形成し、前記ケースの前面部と締付枠の押え部とで液晶パネルとテープキャリアとの異方性導電膜による接続部を内外側から挟圧するとともに、ケースの実行部と締付枠の締付部を締付け固定したものである。

請求項4の発明は、請求項1、2または3の構成において、液晶パネルは、テープキャリアとの接続用の端子を並設したガラス基板の角部を切除したものである。

（作用）

請求項1の発明では、液晶パネルに接続したテープキャリアをその接続部の外側近傍で接続面に対する実行方向に折曲し、この接続部および折曲部分をケースにより外側から覆うとともに、接続部をケースの前面部で内側から押圧することにより、接続部に引きはがす方向の外力が加わることはなく、液晶パネルの端子部分における接続不良が発生せず、良好な接続状態が保たれる。また、テープキャリアおよびケースは共に液晶パネルの表面に対しその実行方向に折曲され、かつ、ケースに回路配線が一体化して形成されているので、液晶パネルの周囲の額縁部の幅を著しく縮小することができ、液晶パネルによる表示面積に比し、外形形状を小さくすることができる。

請求項2の発明では、ケースの形成に際し、外枠と回路配線を形成した筒体とを個々につくって接着結合することにより、製造が容易となる。

請求項3の発明では、ケースの前面部と締付枠の押え部とで、液晶パネルとテープキャリアとの異方性導電膜で接続された領域を内外側から挟圧し、かつ、表示パネルの角部においてケースの実行部と締付枠の締付部とを締め付けて固定することにより、十分な締付けを容易に行なうことができる。

請求項4の発明では、液晶パネルの最大外形となるガラス基板の角部がなく、したがって、前記のような締付けを外形を大きくすることなく容易に行なうことができる。

（実施例）

以下、本発明の一実施例を図面を参照して説明する。

第1図および第2図において、液晶パネル11は、従来と同様に2枚のガラス基板11A，11Bに単位画素を構成する多数のＴＦＴや透明電極等を設けると共に、この2枚のガラス基板11A，11B間に液晶を封入したものである。また、この背面側のガラス基板11Aは、表面側のガラス基板11Bより大きくて縁部が外側に突出しているとともに、この突出した縁部の４個の角部を切除して傾斜部11aを設けている。なお、液晶パネル11としては、上述したＴＦＴを用いた、いわゆるＴＦＴ－ＬＣＤでなくともよく、他のアクティブマトリックス表示デバイスや、ドットマトリックス表示デバイスでもよい。いずれにしても液晶パネル11はガラス基板11A，11Bを有し、この背面側のガラス基板11Aの周縁部（図示の場合は３辺）には画素を駆動するためのリード用の端子が多数配列されている。この端子の本数、すなわち、縦方向の本数ｍと横方向の本数ｎは、一般に全画素数をＺとすると、Ｚ＝ｍ×ｎで示される。例えば、液晶パネル11の対角４インチの表示面にＺ＝１０５６００画素が並んでいれば、縦方向２２０本、横方向４８０本の端子が必要となる。そして、これら各端子を介して各画素を駆動する駆動用のＩＣとして、例えば、縦方向用には１１０素子を１チップに内蔵しているものを用い、横方向には１２０素子を１チップに内蔵しているものを用いる。すなわち、縦方向は１１０素子のＩＣを２個用いて駆動し、横方向は、１２０素子のＩＣを４個用いて駆動する。

ここで、対角４インチの表示部の縦辺と横辺は４０㎜×８０㎜となる。液晶パネル11の周縁部

に配列される端子のピッチは２００㎛より小さいと接続抵抗が高抵になり、接続が困難となるので、横辺方向は上辺と下辺に分け、ＩＣを２個ずつ配置することにより端子ピッチを３３３㎛としている。また、縦方向は片側１辺だけで６端子ピッチは２７２㎛となり、片側１辺にのみＩＣを２個配置している。

上記のような縦方向用のＩＣ12Y および横方向用のＩＣ12X は共に対応する複数のテープキャリア13Y および13X にそれぞれ搭載されて電気的に接続される。この接続は、従来と同様に、金（Au）バンプを形成したＩＣ12X 、12Y の端子と、銅（Cu）リードにすず（Su）メッキを施したポリイミドフィルムベースのテープキャリア13X 、13Y の端子との位置整合を行なった後、加熱加圧によりAu／Sn共晶を行なわせ、接合する。以下、これをＩＬＢ（Inner Lead Bonding）と呼ぶ。

次に、上述のようにしてＩＣ12X 、12Y を搭載したテープキャリア13X 、13Y を液晶パネル11の周縁部の端子に接続する。以下、これをＯＬＢ（Outer Lead Bonding）と呼ぶ。この接続は異方性導電膜を用いて行なう。すなわち、液晶パネル11の端子とテープキャリア13X 、13Y の出力端子とを同ピッチで形成しておき、これらの位置整合を行なったのち、異方性導電膜を介在させ、加熱加圧してこの間を接続する。

16は金属製のケースで、例えば、厚さ 0.5～1.0㎜程度の薄いステンレス等の金属板により形成されている。このケース16は、前記液晶パネル11の前面周縁部を覆う平面状の前面部16a と、この前面部16a の外周からその奥行方向に向って図示のように直角に、またはより鋭角に折り曲げた奥行部16b とを有する枠状をなしている。また、奥行部16b の４個の角部には前記液晶パネル11の各傾斜部11a と対応する傾斜状の接合面16c が形成され、この接合面16c に締付孔17が穿設されている。さらに、奥行部16b の内面に回路配線18が一体化して形成されている。この回路配線18は、前記駆動用のＩＣ12X 、12Y の端子群をそれぞれ個別に接続して、駆動用のＩＣ12X 、12Y の入力端子に特定の電圧や信号を与えるものである。このような形状は絞り加工によって容易に得ることができる。

19は前記ケース16の内側に配設される金属製の締付枠である。この締付枠19は、前記ケース16の前面部16a に対向する押え部19a およびこの押え部19a の４個の角部外側から前記ケース16の奥行部16b の角部における接合面16c と対向する締付部19b を折曲形成し、この締付部19b に締付孔20が穿設されている。

そうして、前記各テープキャリア13X 、13Y は、液晶パネル11の端子と接続した後、図示のようにその接続部の外側近傍で接続面に対する奥行方向に折り曲げておく。この場合、折り曲げ部に相当するポリイミドベースフィルムを部分的に除いておくと、曲げた場合にＯＬＢ部に応力が生じることはない。

この状態において、前記ケース16を液晶パネル11の表面側からかぶせ、その前面部16a によって液晶パネル11の端子とテープキャリア13X 、13Y との異方性導電膜によるＯＬＢ部分を表側から覆い、この部分をゴム等のクッション材21を介して押え付け、接着部分がはがれないように保護する。また、ケース16の奥行部16b によって、テープキャリア13X 、13Y の奥行方向に折曲された部分や、それに接続されているＩＣ12X 、12Y をそれらの外側から覆って保護する。

また、前記ケース16の内側に締付枠19を配置し、ケース16の前面部16a と締付枠19の押え部19a とで液晶パネル11とテープキャリア13X 、13Y との異方性導電膜による接続部を内外側からゴム等のクッション材22を介して挟圧するとともに、ケース16の奥行部16b における角部の接合面16c と締付枠19の締付部19b とを両者間にスペーサを配置して締付孔17、20を介してねじ等で締付け固定する。

このように、締付枠19を用いれば、ＯＬＢ部を一層強固に締付け固定することができる。

このようにして、接着力の比較的弱いＯＬＢ部をケース16の前面部16a によって覆い、保護す

ることにより、この部分に引きはがし方向の力が加わることはなく、安定した接続状態を保つことができ、信頼性が向上する。また、液晶パネル11の端子に接続されたテープキャリア13X，13Yおよびこれらを覆うケース16を、共に液晶パネル11の表面に対しその実行方向に折曲させているので、従来のように、液晶パネル11の表示部周囲にICやプリント基板等が位置することない。したがって、表示部周囲の、いわゆる額縁部の幅が従来のように大きくなることはなく、表示部面積に比べこの額縁部分の寸法を小さくでき、全体を小形化できる。

また、前記ケース16の実行部16bの内面に一体化して形成した回路配線18の端子にテープキャリア13X，13Yの入力端子をはんだ付けして接続する。すなわち、上記IC12X，12Yの入力側の端子を、テープキャリア13X，13Yを介して回路配線18に接続する。なお、ケース16は、電気的には電磁シールドの機能を持たせるべく、ノイズを低減する場所数箇所を回路配線18のアース部に接続する。このようにすることにより、従来のように回路配線を形成するためのプリント基板を別体に設ける必要はなく、より一層小形化できる。

次に、前記ケース16の実行部16bの内面に回路配線18を直接一体的に形成する方法を説明する。

まず、ケース16を形成する例えば厚さ0.5mmのステンレス板等からなる金属板材において、その実行部16bに対応する部分の内面に、厚さ25μmの絶縁をエポキシ樹脂によって貼付け一体にする。次に、フォトレジスト塗布や露光、現像、エッチング等の通常のプロセスにより所望の回路配線を形成する。さらに、絶縁ペーストを2層程度形成し、ピンホールのない完全な絶縁膜を印刷法により形成する。この場合、スルーホール部のみ下層の銅箔が露出した状態とする。そして、この上から銀ペーストを印刷し、硬化させることにより2層配線の回路配線が得られる。さらに、この上にソルダーレジストを印刷により塗布するが、後でテープキャリア13X，13Yの入力端子と接続される場所や、受動部品チップがはんだ付けされる場所等は、前述した下層銅箔が露出するように塗布する。そして、この回路配線を一体化した板材を曲げ絞り加工し、ケース16を形成する。ついで、上記下層銅箔が露出した部分に、受動部品チップ、例えばスプリアスラジエーションノイズ低減のためのLCフィルタ、RCフィルタ等を構成するR.C.L.チップ部品をはんだ付けにより搭載し、ケース16と一体形の回路配線18を構成する。

上記回路配線18に対しては、前記のように、ケース16を液晶パネル11に装着した後、テープキャリア13X，13Yの入力端子がはんだ付け接続され、さらに必要に応じて、ケース16と回路配線18のアース部とを接続し、組立てが完了する。

また、ケース16に回路配線18を一体的に形成する場合、多層配線を形成した薄いフレキシブル回路基板を、ケース16の実行部16bの内面に貼付けて一体化することもできる。

上記実施例では、ケース16として一体形のものを示したが、第3図および第4図で示すように、ケース16を、前面部16aを主体としたステンレス等による外枠16Aと、実行部16bとして用いられるアルミ等による角状の筒体16Bとを組合せたものを用いてもよい。上記外枠16Aは前面部16aの4個の角部外周からそれぞれ実行方向に向って接合部16c1を一体に折曲形成し、この接合部16c1に締付孔17aを穿設し、また、上記筒体16Bは実行部16bの4個の内部に接合部16c2を形成し、この接合部16c2に締付孔17bを穿設する。そして、外枠16Aの接合部16c1を筒体16Bの接合部16c2の外面に接合させ、この面を接着剤によって一体に結合し、ケース16として組立てる。この場合、回路配線18は筒体16Bの内面に一体化して形成すればよい。そして、締付孔17a，17bにより締付枠19とともに締付ければよい。

上記いずれの実施例においても、各テープキャリア13X，13Yや駆動用のIC12X，12Y、回路配線18は金属製のケース16により包囲されるので、このケース16により電磁シールドされると共に、外力等からも保護される。

（発明の効果）

請求項1の発明によれば、液晶パネルに接続したテープキャリアをその接続部の外側近傍で接続面に対する突行方向に折曲し、この接続部および折曲部分をケースにより外側から覆うとともに、接続部をケースの前面部で表側から押圧することにより、接続部に引きはがす方向の外力が加わることはなく、液晶パネルの端子部分における接続不良が発生せず、良好な接続状態が保たれ、信頼性が向上する。また、テープキャリアおよびケースは共に液晶パネルの表面に対しその突行方向に折曲され、かつ、ケースに回路配線が一体化して形成されているので、部品点数が減少するとともに装置が薄形化し、液晶パネルの周囲の額縁部の幅を著しく縮小することができ、液晶パネルによる表示面積に比し、外形形状を小さくして、小形コンパクトにすることができる。さらに、金属製のケースにより電磁シールドの役を果たさせることができる。

請求項2の発明によれば、ケースの形成に際し、外枠と回路配線を形成した個体とを個々につくって嵌合することにより、ケースの製造が容易となる。

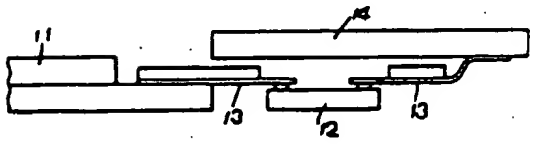
請求項3の発明によれば、ケースの前面部と締付枠の押え部とで、液晶パネルとテープキャリアとの異方性導電膜で接続された領域を内外側から挟圧し、かつ、表示パネルの角部においてケースの突行部と締付枠の締付部とを締め付けて固定することにより、十分な締付けを容易に行なうことができ、安定した接続状態を得ることができる。

請求項4の発明によれば、液晶パネルの最大外形となるガラス基部の角部がなく、したがって、前記のような締付けを外形を大きくすることなく容易に行なうことができ、小形に容易に形成することができる。

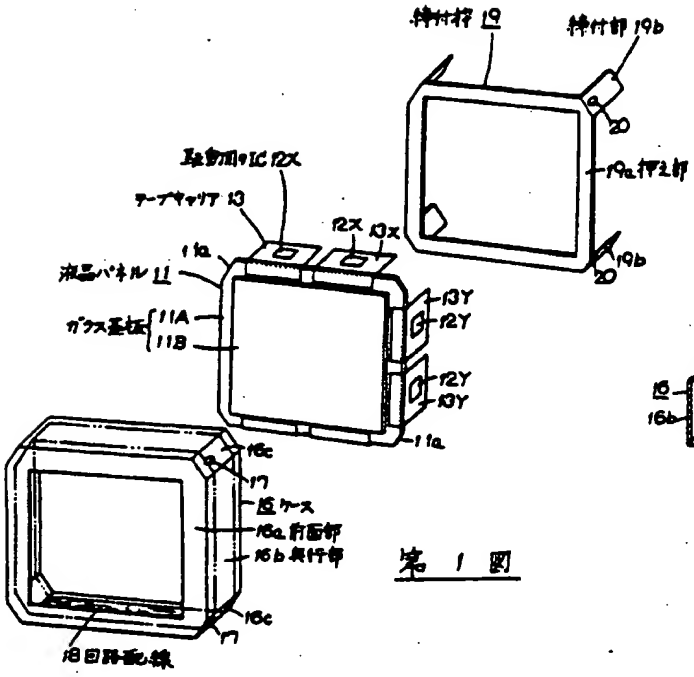
4．図面の簡単な説明

第1図は本発明による液晶表示装置の一実施例を示す分解斜視図、第2図は第1図の組立状態を示す断面図、第3図は本発明の液晶表示装置の他の実施例を示す一部の断面図、第4図は第3図のケースの分解斜視図、第5図は従来の装置を示す断面図である。

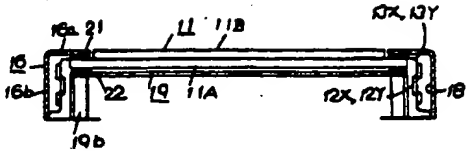
11・・液晶パネル、11A，11B・・ガラス基板、12X，12Y・・駆動用のIC、13X，13Y・・テープキャリア、15・・ケース、16a・・前面部、16b・・突行部、18・・回路配線、19・・締付枠、19a・・押え部、19b・・締付部、16A・・外枠、16B・・個体、16c1，16c2・・嵌合部。



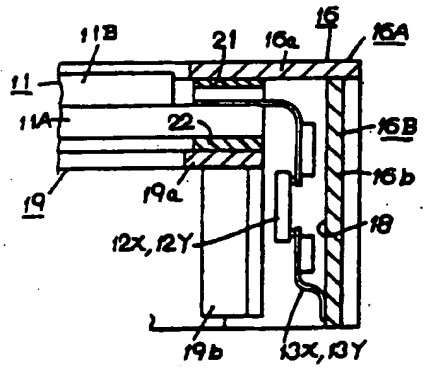
第5図



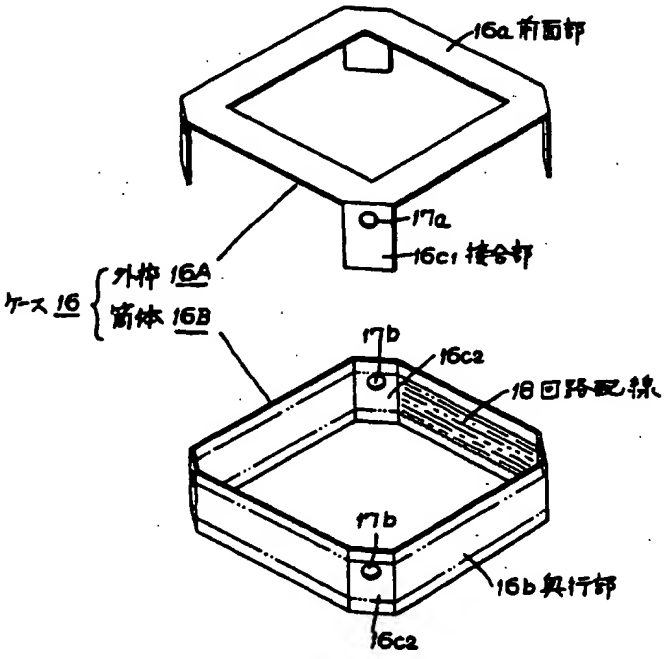
第 1 図



第 2 図



第 3 図



第 4 図